

**Office Action Summary**

Application No.

09/755,673

Applicant(s)

FORBES ET AL.

Examiner

Khiem D Nguyen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 29 April 2003.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-26 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 05 January 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) g.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

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## **DETAILED ACTION**

### ***Response to Amendment***

Applicant's arguments filed 04/29/03 have been fully considered but they are not persuasive.

The Rejection from paper No. 7 sent 01/29/2003 is incorporated in this paper. It is presented here for convenience.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Choi et al. (JP 2000058777) in view of Zhang (U.S. Patent 5,886,364), Chiu et al. (TW 381343) and Sun et al. (U.S. Patent 6,150,209).

Choi discloses a method of forming a capacitor structure, comprising (See BASIC-ABSTRACT and FIG. 8):

forming a first electrical node 102 comprises conductively doped silicon;

forming a dielectric layers 115 comprising aluminum nitride over the first electrical node;

forming a second electrical node 105 that is electrically separated from the first electrical node by at least the dielectric material; the first electrical node, second

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electrical node and dielectric material together defining at least a portion of a capacitor structure.

Choi fails to explicitly disclose that the dielectric layer is a layer of metallic aluminum that being entirely transformed into AlN, AlON or AlO wherein the listed compounds are described in terms of chemical constituents rather than stoichiometry as recited in present claims 1-4, 6-8, 10, 11, 16-19, 24 and 25.

Zhang discloses that the dielectric layer is a layer of metallic aluminum 32 that being entirely transformed into aluminum nitride (AlN), aluminum oxynitride (AlON) or Aluminum oxide (AlO) wherein the listed compounds are described in terms of chemical constituents rather than stoichiometry (col. 5, lines 43-56 and FIG. 3B). It would have been obvious to one of ordinary skill in the art of making semiconductor devices to combine the teaching of Choi and Zhang to enable the AlN, AlON or AlO layer of Choi to be formed.

Neither Choi nor Zhang discloses forming a layer of silicon dioxide between the first electrical node and the layer of metallic aluminum as recited in present claims 11, 19, 20 and 22.

Chiu discloses forming a silicon dioxide layer 20 between the first electrical node 18 and the dielectric layer 22 (BASIC-ABSTRACT and related FIG.). It would have been obvious to one of ordinary skill in the art of making semiconductor devices to combine the teaching of Choi, Zhang and Chiu to enable the silicon dioxide layer of Choi to be formed and further more to prevent dielectric cracking of capacitors (BASIC-ABSTRACT).

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Chiu also discloses forming a second dielectric layer 26 on the first dielectric layer. It would have been obvious to one of ordinary skill in the art of making semiconductor devices to combine the teaching of Choi, Zhang and Chiu to enable the second AlON or AlO layer of Choi to be formed.

Neither Choi nor Zhang discloses the transforming temperature and the thickness ranges of the resulting layers of AlN, AlON, AlO and silicon dioxide as recited in present claims 5, 7, 9, 10, 12, 13, 15, 17, 18, 21, 23 and 25.

However, there is no evidence indicating that the transforming temperature and thickness ranges of the resulting layers of AlN, AlON, AlO and silicon dioxide are critical and it has been held that it is not inventive to discover the optimum or workable height of a result-effective variable within given prior art conditions by routine experimentation. See MPEP 2144.05.

None of the references explicitly disclose providing a transistor adjacent the capacitor structure wherein the transistor and a capacitor structure together defining a DRAM cell comprising the transistor and the capacitor structure as recited in present claim 26.

Sun discloses providing a transistor adjacent the capacitor structure wherein the transistor and a capacitor structure together defining a DRAM cell comprising the transistor and the capacitor structure (FIGS. 1-5 and related text). It would have been obvious to one of ordinary skill in the art of making semiconductor devices to combine the teaching of Chiu, Choi, Zhang and Sun to enable a DRAM cell comprising the transistor and the capacitor structure of Choi to be formed.

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***Response to Amendment******Response to Applicant's Arguments***

Applicant's arguments filed 04/29/2003 have been fully considered but they are not persuasive. Applicant argues that there is no reason to combine Choi and Zhang as they are non-analogous arts. Examiner respectfully disagrees, while examiner concedes Zhang does not specify the forming of a capacitor or Choi a TFT, neither rules out the possibility of forming other device than the few Zhang and Choi <sup>teach</sup> teaches. Indeed, one ordinarily skilled in the art would reasonably believe that many devices numbering thousands or even millions would be formed to complete a product. In microelectronic processing it is preferable to share as many common steps between devices to lower the production cost. Further, since the Choi reference teaches the formation of the AlN layer, but not the means, it is reasonable, that forming Choi's capacitor <sup>and</sup> along with Zhang's TFT on the same substrate would use Zhang's process of forming AlN.

For these reasons, examiner holds the rejection proper.

***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

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extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Khiem D Nguyen whose telephone number is (703) 306-0210. The examiner can normally be reached on Monday-Friday (8:00 AM - 5:00 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on (703) 306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 305-3432 for regular communications and (703) 305-3432 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

K.N.

December 24, 2003